AVHRR Pathfinder and In Situ Sea Surface Temperatures on Coral Reefs

Kenneth S. Casey and Marguerite Toscano
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1 Introduction

This document describes a collection of data files created by Maggie Toscano and Ken Casey at NOAA's National Oceanographic Data Center. These files contain co-located satellite-derived and in situ based sea surface temperature (SST) observations from numerous coral reef locations around the world. The satellite SSTs were extracted from the NOAA/NASA AVHRR Oceans Pathfinder product, a collection of global, twice-daily, 9 km resolution SST observations available between 1985 and mid-2001 (1999-2001 observations are obtained from an interim Pathfinder dataset not yet publicly available). The in situ records were collected from a variety of sources and measurement devices. Some of these data are publicly available via the world wide web, while others were provided by individual researchers working at the reef locations. The details on each in situ dataset are provided below.

2 Spatial Coverage

Figure 1 indicates the 20 reef locations covered by the present version of this collection. Locations are indicated by a white circle on a map of climatological mean SST for the 5-day period Jan 1-5. Since many of these sites are clustered close together, detailed views of the Florida Keys/Caribbean and Great Barrier Reef regions are presented in Figure 2.

Owing to the 9 km resolution of the AVHRR Pathfinder data and problems with the land masks used in its initial processing steps, sometimes the precise latitude-longitude values for a given coral reef location resulted in a pixel identified as land in the satellite data set. This problem is minimized by extracting from the satellite data set not only the central pixel which corresponds to the reef's latitude-longitude, but also the surrounding 3x3 pixel box of satellite SST measurements. The average of this 3x3 box is recorded along with the central pixel values.

3 Temporal Coverage

The AVHRR Pathfinder SST are available twice-daily, corresponding to a nighttime satellite pass and a daytime satellite pass, between 1985 and mid-2001. Note, however, that clouds can significantly reduce the available number of satellite-based observations. The satellite passes occur at approximately 2am for the nighttime pass and 2pm for the daytime pass. These times vary between satellites and may drift for a given satellite.

The in situ data records vary widely in their temporal coverage and sampling times. Some sites provided only 24-hour mean SST, while others provided hourly measurements. Other provided minimum, maximum, and 24-hour mean values. For sites that provide hourly measurements, the minimum, maximum, 24-hour mean, observations at 2am and 2pm, and the nighttime (8pm-8am) and daytime (8am-8pm) averages are recorded. These additional values will facilitate comparisons with the satellite data.

4 Data File Format

All data files are stored as plain ASCII text. The first 16 lines contain header information, including the file format and latitude-longitude values for that location. Following the header lines are the data records in temporal sequence, beginning with Jan 01, 1985 (01 01 1985) and ending with Dec 31, 2001 (31 12 2001). There is exactly one record per day during the time interval. Missing values are indicated by a -3.00 and all temperatures are in degrees C.

The data columns contain the following information:
Column 1: Day (01-31)
Column 2: Month (01-12)
Column 3: Year (1985-2001)
Column 4: DAYCPIX - The SST from the central pixel from the daytime satellite pass
Column 5: DAY3x3 - The average SST of the 3x3 box centered on the central pixel from the daytime satellite pass
Column 6: NIGHTCPIX - The SST from the central pixel from the nighttime satellite pass
Column 7: NIT3x3 - The average SST of the 3x3 box centered on the central pixel from the nighttime satellite pass

Column 8: DAYNITCPIX - If both daytime and nighttime satellite passes contain valid SSTs for the central pixel, their average is recorded here
Column 9: DAYNIT3x3 - If both daytime and nighttime satellite passes contain valid SSTs for the 3x3 averages around the central pixel, their average is recorded here
Column 10: MIN - the minimum in situ SST
Column 11: MAX - the maximum in situ SST
Column 12: 24hrMEAN - The average of all in situ SST observations for this 24-hour period
Column 13: 2amSST - The hourly in situ SST observation recorded at 2am
Column 14: 2pmSST - The hourly in situ SST observation recorded at 2pm
Column 15: DAYAVG - The average of all hourly in situ SST observations between 8am and 8pm.
Column 16: NITAVG - The average of all hourly in situ SST observations between 8pm and 8am.

5   Available Data Files

The following list contains the presently available sites:
AcademyBay2.txt: (0.750N,-90.306W) (Pixel: 1033,1021)
AdderlyDropoff.txt: (23.79N,-76.10W) (Pixel: 1295,1183)
Agincourt.txt: (-16.20S,145.49E) (Pixel: 840,3704)
BarracudaRx.txt: (23.67N,-76.20W) (Pixel: 1294,1182)
ClevelandBay.txt: (-19.09S,146.53E) (Pixel: 807,3716)
Davies.txt: (-18.50S,147.41E) (Pixel: 814,3726)
DryTortugas.txt: (24.64N,-82.86W) (Pixel: 1305,1106)
FoweyRocks.txt: (25.59N,-80.10W) (Pixel: 1316,1137)
Hardy.txt: (-19.44S,149.10E) (Pixel: 803,3745)
LongKey.txt: (24.84N,-80.86W) (Pixel: 1307,1128)
LSIDock.txt: (23.77N,-76.11W) (Pixel: 1295,1183)
MolassesReef.txt: (25.01N,-80.38W) (Pixel: 1309,1134)
Mombasa3.txt: (-3.99S,39.93E) (Pixel: 979,2503)
Myrmidon.txt: (-18.16S,147.22E) (Pixel: 818,3724)
Naos.txt: (8.918N,-79.533W) (Pixel: 1126,1144)
Nelly1.txt: (-19.17S,146.87E) (Pixel: 806,3720)
NingalooS.txt: (-23.14S,113.77E) (Pixel: 761,3343)

RainbowGdns.txt: (23.80N,-76.15W) (Pixel: 1295,1182)
SandKey.txt: (24.45N,-81.88W) (Pixel: 1303,1117)
SettlementPoint.txt: (26.70N,-79.00W) (Pixel: 1328,1150)
SharkRock.txt: (23.75N,-76.12W) (Pixel: 1295,1182)
SombreroReef.txt: (24.63N,-81.82W) (Pixel: 1305,1118)
SouthPerry.txt: (23.77N,-76.09W) (Pixel: 1295,1183)
SouthPerry2.txt: (23.77N,-75.99W) (Pixel: 1295,1184)

6 Data Uses and Availability

These combined satellite and in situ data files are presently being used to assess the capability of the AVHRR Pathfinder data to accurately monitor SST on coral reefs around the world. They are currently available upon request via FTP at ftp.nodc.noaa.gov. Requests may be made to Ken Casey at Kenneth.Casey@noaa.gov.
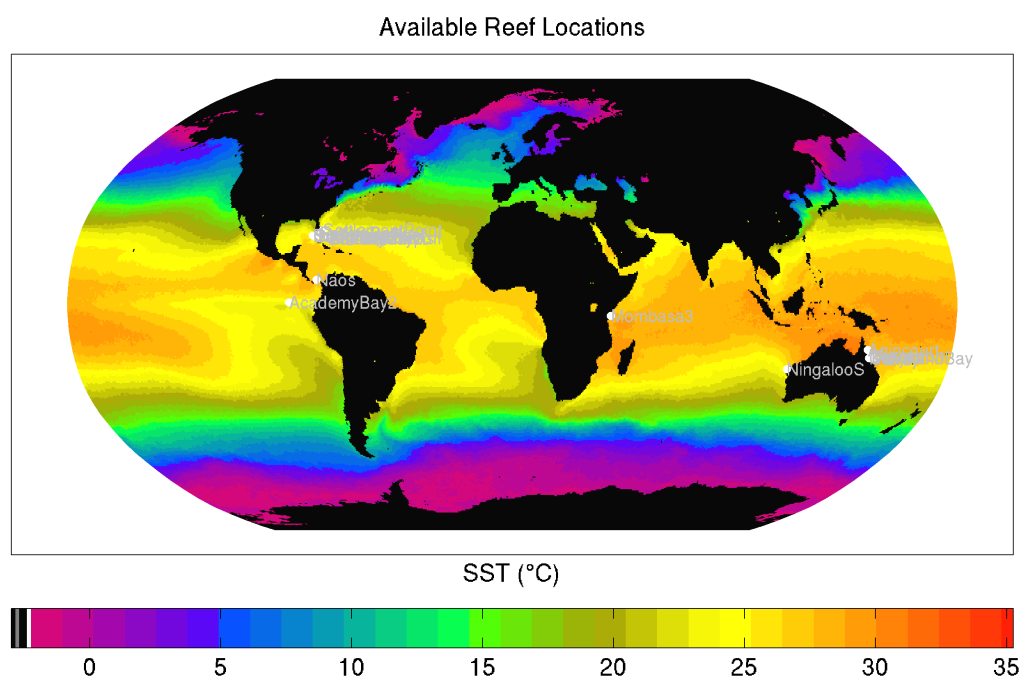
Figure 1: Location of coral reefs included in this dataset are noted by a white circle on the map of climatological mean SST for the five-day period Jan 1 - Jan 5.
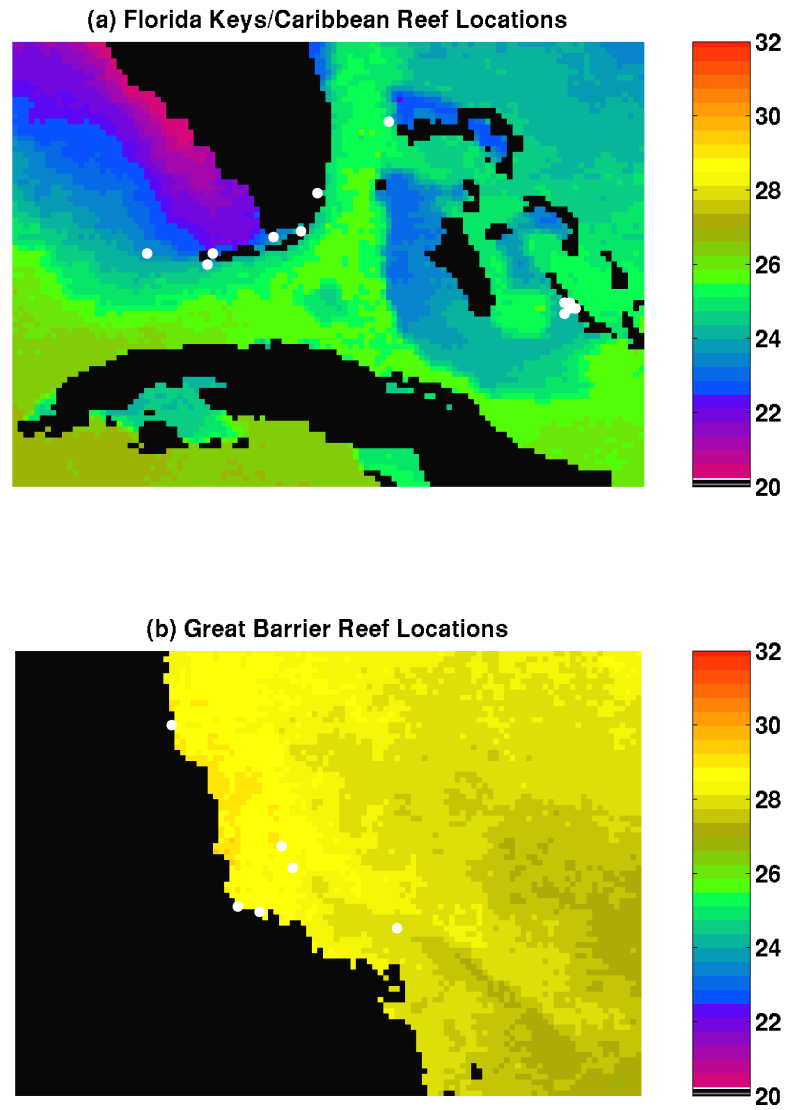
Figure 2: Reef locations as in Figure 1, with detailed views of the Florida Keys/Caribbean (a) and Great Barrier Reef (b).